



THE SAN FRANCISCO-OAKLAND  
**BAY BRIDGE**  
SEISMIC SAFETY PROJECTS

CAITRANS BAY AREA TOLL AUTHORITY CALIFORNIA TRANSPORTATION COMMISSION

FOR THE LATEST INFORMATION, VISIT



BayBridgeInfo.org



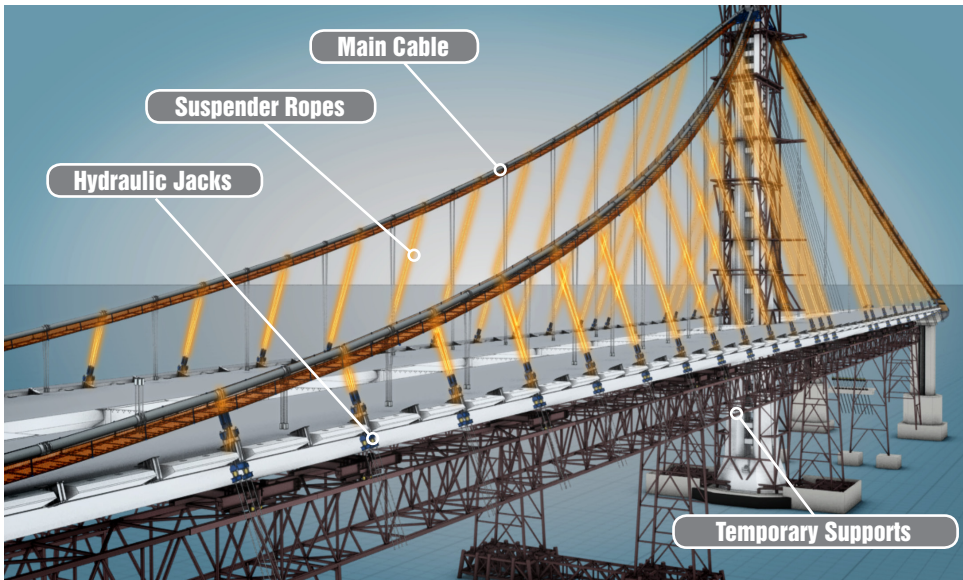
Twitter.com/BayBridgeInfo



Facebook.com/BayBridgeInfo

## SELF-ANCHORED SUSPENSION SPAN (SAS) LOAD TRANSFER

American Bridge/Fluor Enterprises: Contractor  
T.Y. Lin International/Moffatt & Nichol: Bridge Designers



**The Self-Anchored Suspension Span (SAS), the signature element of the new East Span, is the largest bridge of its kind in world. At 2,047 feet, the SAS not only raises the bridge building bar to new heights, it also presents its own unique set of challenges.**

Traditional suspension bridges, such as the Bay Bridge's West Span and the Golden Gate Bridge, have towers with two main cables that tie into anchorages in the ground. After the suspender cables are attached to the main cable, the deck is hung from the cables.

The SAS is self-anchoring with one main cable that anchors to the decks, so the roadway must be built first. Building a different kind of suspension bridge such as the SAS required a different kind of construction strategy. With nothing to hold up the roadway, a temporary bridge was required — 20,000 tons of steel to support the approximately 35,200-ton permanent span. With the temporary supports in place, crews first built the road-decks and tower, then anchored the cable into the roadways.

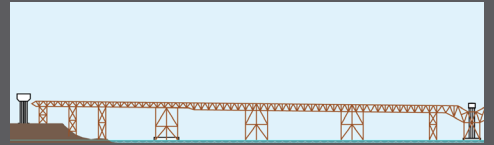
Now that the road-decks, tower, main cable and suspender cables are in place, the construction crew is ready to flex its muscles and transfer the weight of the span from the temporary supports to the main cable, a complex time- and labor-intensive process known as load transfer.

Two hundred steel wire suspender ropes, attached to 100 cables bands along the single main cable, do the heavy lifting during load transfer. Sets of suspender ropes are gradually tensioned using hydraulic jacks; as each cable band carries two ropes, there are four hydraulic jacks (each exerting as much as 400-tons of force) at each corresponding location along the outside of the road-decks tensioning and pulling the ropes into position.

The nearly 1-mile-long cable is the longest single looped suspension bridge cable in the world. As the cable takes the weight of the decks, the curve of the cable moves as much as 30 feet out and 16 feet down; the suspender ropes also stretch as they are tensioned.

While the first 104 of the 200 ropes are tensioned, the decks lift and compress, and the bridge becomes self-anchored and self-supporting. The remaining 96 ropes are attached to help distribute the weight amongst the ropes and main cable evenly.

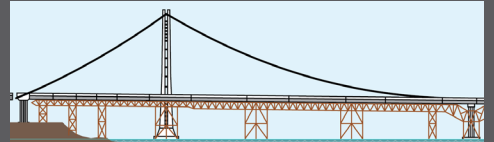
### BUILDING A SELF-ANCHORED SUSPENSION SPAN



CONSTRUCT TEMPORARY SUPPORTS



ERECT DECK SEGMENTS ON TEMPORARY SUPPORTS AND CONSTRUCT TOWER



CONSTRUCT MAIN CABLE



INSTALL CABLE BANDS



HANG SUSPENDER ROPES

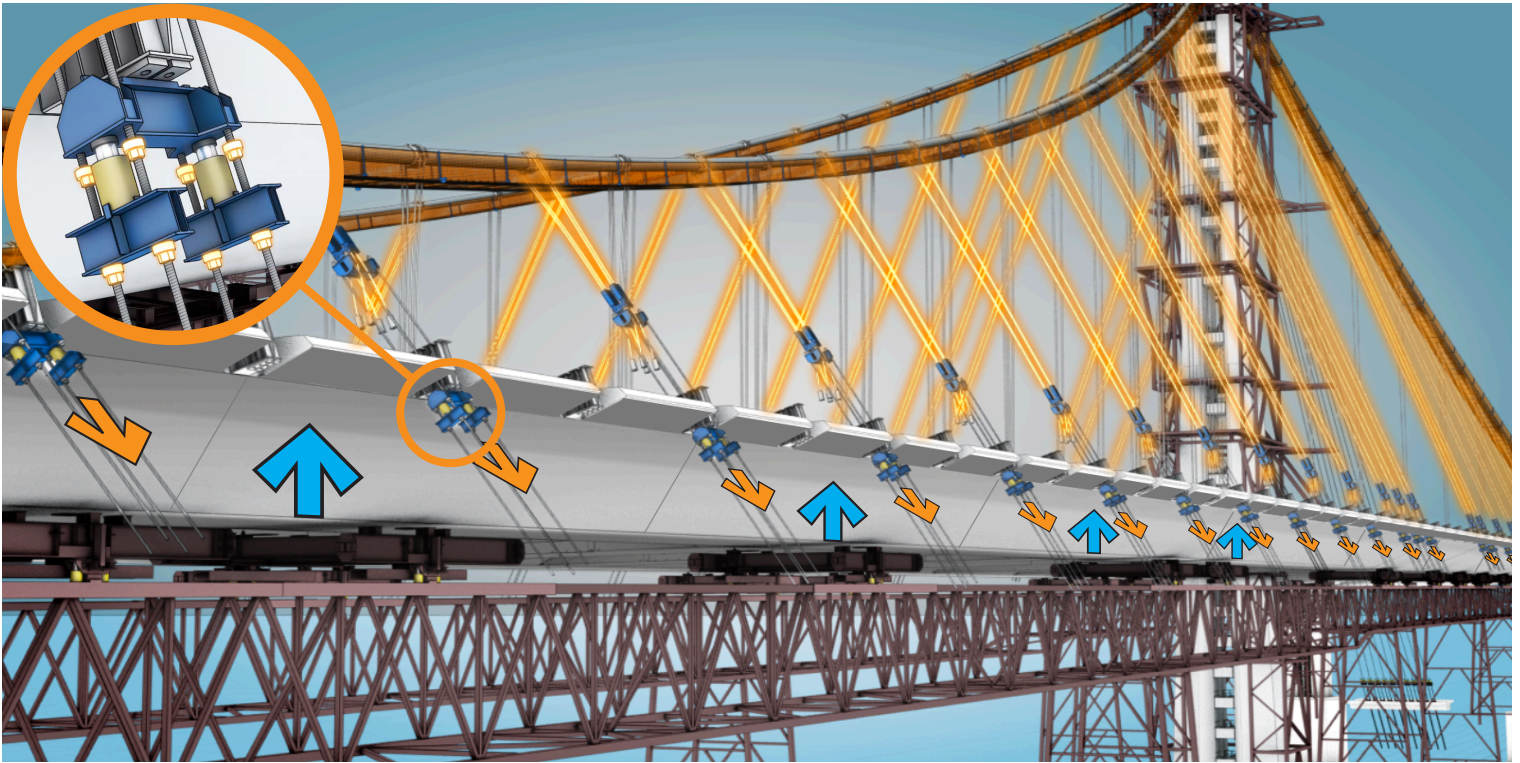


LOAD TRANSFER

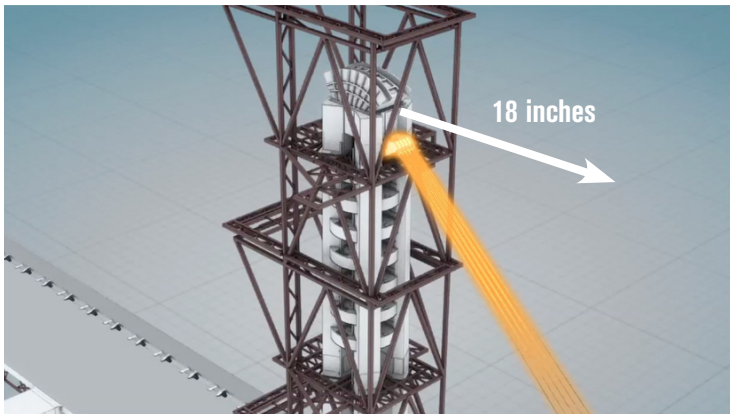


REMOVE TEMPORARY SUPPORTS

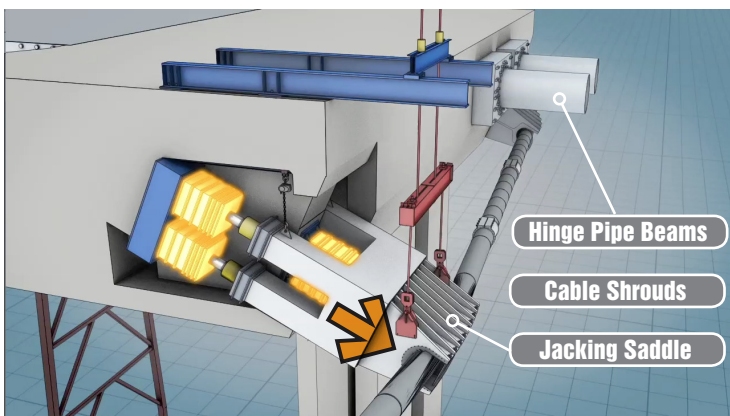
## SELF-ANCHORED SUSPENSION SPAN (SAS) LOAD TRANSFER



**AS THE SUSPENDER CABLES ARE TENSIONED, THE DECK RISES INTO POSITION**



**TOWER PULLBACK**



**TENSIONING THE CABLE AT THE JACKING SADDLE AT W2**

Suspender rope tensioning is not occurring in a vacuum. As the superstructure compresses and lifts, workers are busy at the west end of the span and at the single, 525-foot-tall tower working to equalize tension on the main cable.

The tensioning of the suspender ropes exerts force on the main cable. A jacking saddle at the west end keeps the tension balanced throughout the entire cable. Hydraulic jacks exerting up to 4,800-tons of force will push the cable west in small increments until equilibrium throughout the cable is achieved. Once those 104 suspender ropes are tensioned properly, protective steel shrouds are installed around the cable near the saddles.

To properly balance the asymmetric structure during the main cable installation, crews pulled the top of the tower 18 inches to the west, using temporary cables anchored into the bedrock of Yerba Buena Island. As the suspender ropes and main cable are tensioned, the tower is moved back into position.

Once load transfer is completed, the crews will start to remove the temporary supports and the cable will act like a giant sling supporting the weight of the deck.

The bridge has been engineered with multiple redundancies, surpassing seismic safety standards. The bridge is designed and built to withstand the largest possible earthquake within 1,500 years.

**Download Media!**

MEDIA  BAR

Available at [BayBridgeInfo.org/MediaBar](http://BayBridgeInfo.org/MediaBar)